

# Group Velocity Reduction through Line Defect Photonic Crystal Waveguide

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Photonic crystal (PhC) waveguides offer unique dispersion properties, i.e. low group-velocity and extremely high Group Velocity Dispersion. These properties may in turn enable optical delay lines and optical pulse compression/dilation. This work investigates the group delay (GD) through a 80  $\mu\text{m}$  long single-line defect PhC waveguides fabricated using E-beam lithography and RIE etching. The TE mode gap beginning at  $\sim 1534$  nm, was confirmed by transmission measurements using a TE polarized input. Group delay was investigated using swept wavelength interferometry and the Jones matrix method. The average GD of the two eigenstates of polarization shows a dramatic increase near the band edge compared with a reference waveguide. The Differential Group Delay (DGD), the difference between the delays of the two polarization eigenstates, was observed to be as much as 30ps near the edge of the mode gap through the PhC waveguide. This is believed to be due to the slow light transmission of the TE mode at a largely reduced group velocity near the edge of the mode gap, which corresponds to a group velocity for the TE modes less than 0.01c.

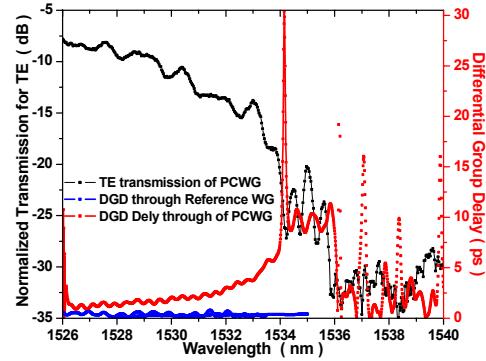


Fig.1 Transmission spectrum with TE polarized input (left axis) and Differential Group Delay (right axis) through a 80  $\mu\text{m}$  single-line-defect PhC waveguide